



Manual 14-D

Generator Operational Requirements

Revision 50




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September, 5 2019

Manual 14-D, Generator Operational Requirements

	Committee	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rev. 49 Non-Retail Behind the Meter Generation	SOS		● 7/2 ★ 7/31					
	OC	● 6/11		★ 8/6				
	MRC		● 6/27			★ 9/26		
Rev. 50 Energy Storage Resource Participation	SOS	● 6/6*			★ 9/5			
	OC	● 6/11*			★ 9/10			
	MRC					● 9/26	★ 10/31	
Rev. 51 DER Ride - through	SOS					● 10/10	★ 11/7	
	OC					● 10/15	★ 11/12	
	RSCS					○ 10/18		
	MRC						● 10/31	★ 12/5

- *First Read*
- ★ *Endorsement*
- *Info Only*

**Initially presented as Rev. 49*

Action Required	Deadline	Who May Be Affected
<p>Compliance with new manual requirements as they apply to Energy Storage Resource model participants</p> 	<p>12/3/2019</p> 	<p>ESR / Generation Owners</p> 

Changes specific to Energy Storage Resource (ESR) participation model

- Driven by FERC Order 841 Compliance Filing

Changes unrelated to Energy Storage Resource (ESR)

- Changes for consistency with M-13, Emergency Operations
- Cover to cover review
- Administrative changes
- Clarifying changes
- DRAFT Changes related to Non-Retail Behind the Meter Generation covered separately

Changes specific to Energy Storage Resource (ESR) participation model

- Driven by FERC Order 841 Compliance Filing

New section titled Definitions and Applicability

- including OATT definitions of:
 - Energy Resource
 - Capacity Resource
 - Energy Storage Resource
 - Capacity Storage Resource
- Added language to clarify applicability of M-14D requirements to generation and storage resources

Definitions and Applicability (cont'd)

- Added definition of Generating Facility
 - Definition included in PJM Compliance filing related to FERC Order 845 (not 841), *Reform of Generator Interconnection Procedures and Agreements*
 - Will become Tariff-defined term if / when accepted by the FERC

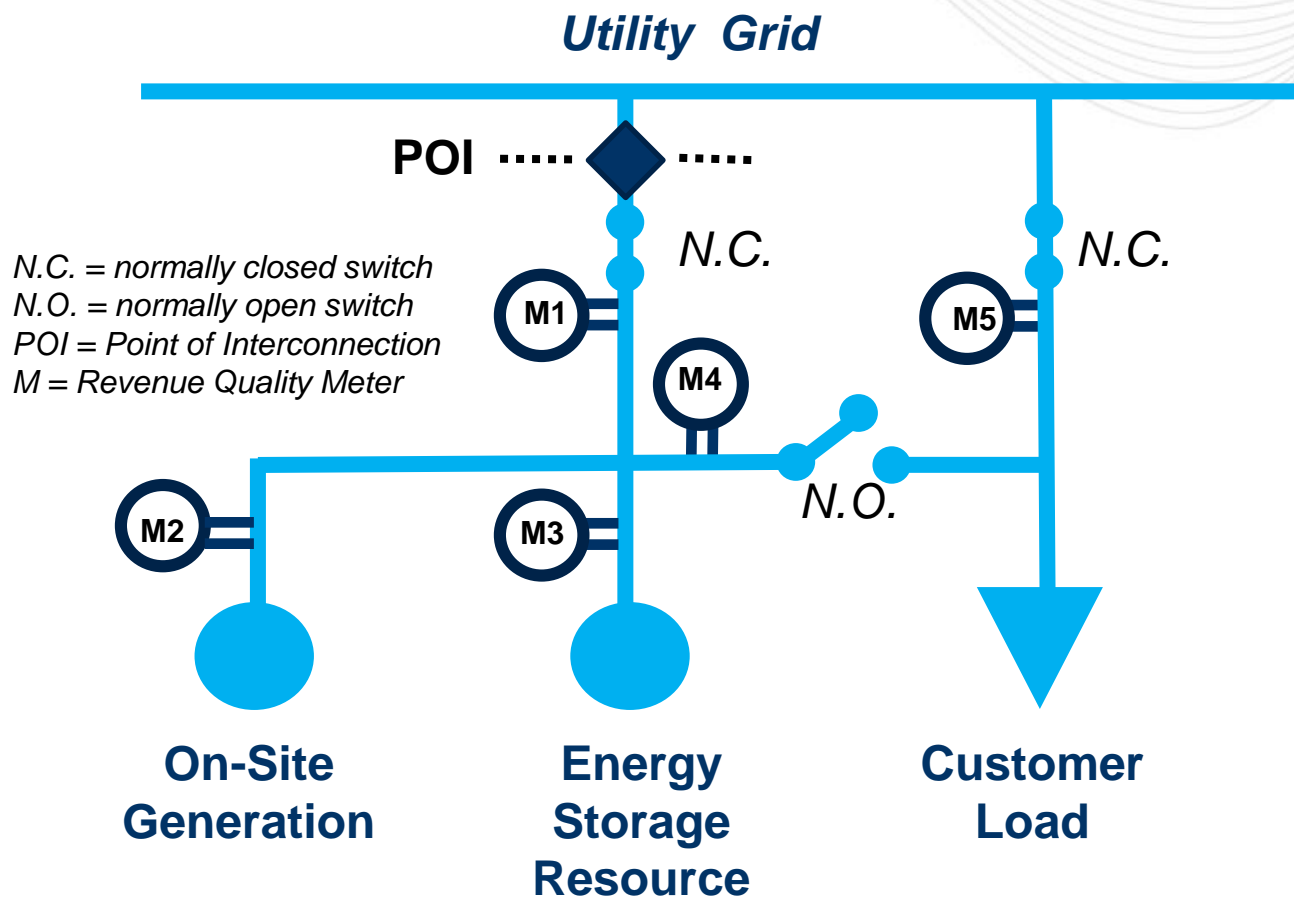
Section 4.1.7: SCADA - Supervisory Control and Data Acquisition

- Updated Exhibit 6 to include telemetry of State of Charge for Energy Storage Resource Model Participants

Section 4.2.3: Metering for Individual Generators

- Added metering requirements specific to Energy Storage Resources
- Metering requirements vary based on implementation of ESR

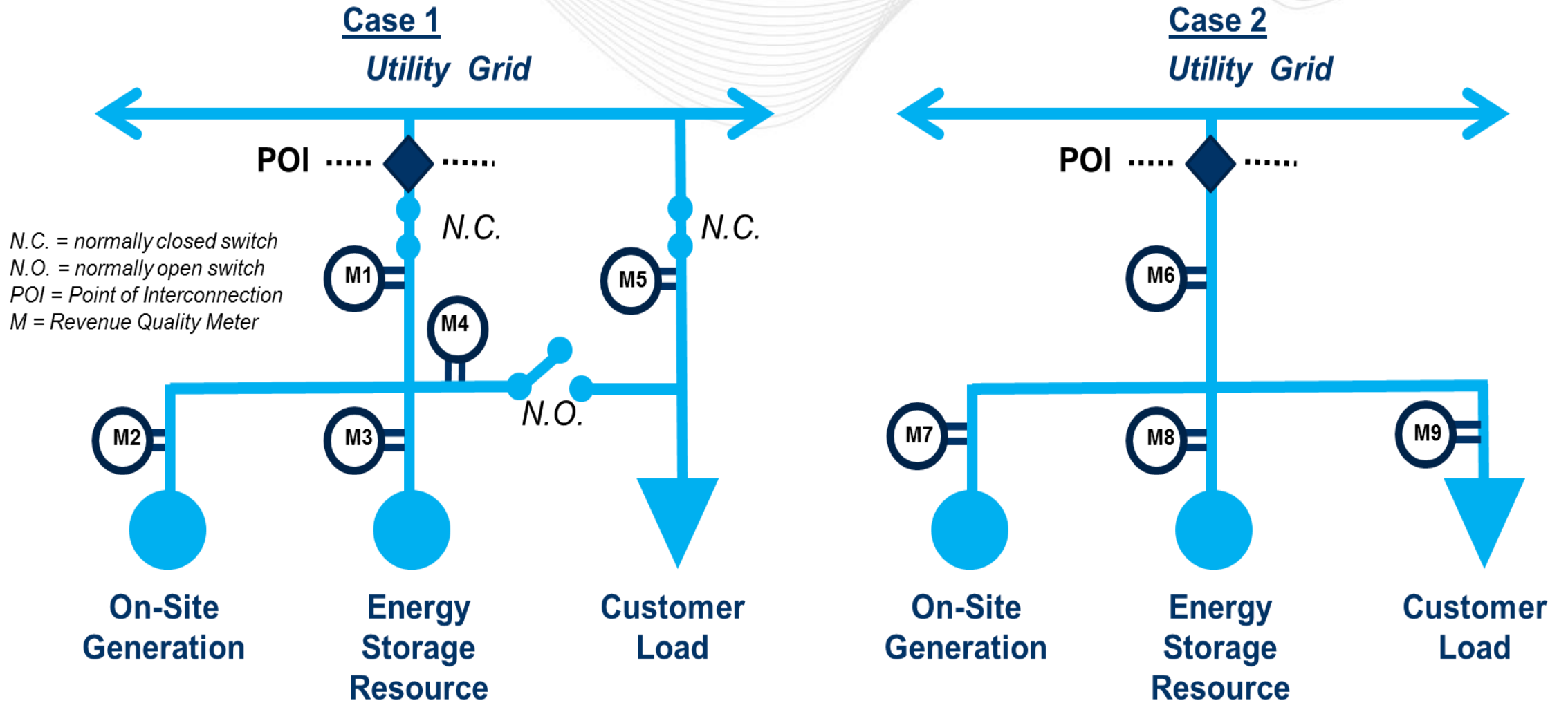
M-14D – Changes Specific to ESR Participation Model - Metering



Number and location of measurement devices required will vary depending on how ESR operates

Energy Storage Resources that are co-located with end use load that is not Station Power shall provide a device for measurement of MWh located directly on the Energy Storage Resource terminals (M3 in diagram at left.)

M-14D – Changes Specific to ESR Participation Model - Metering

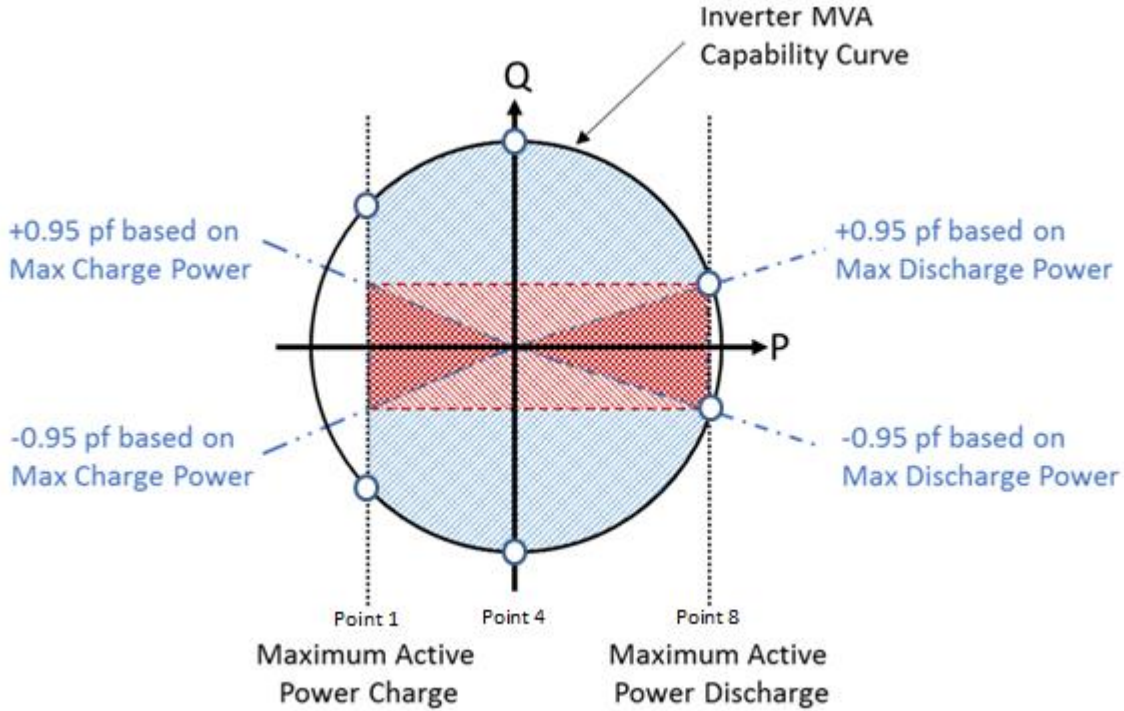


Section 7.3: Critical Information and Reporting Requirements

- Added Energy Storage Resource outage reporting requirements
- Charging or lack of charge alone does not require an eDART ticket

Attachment D: PJM Generating Unit Reactive Capability Curve Specification and Reporting Procedures

- Updated to include Energy Storage Resources
- Updated stand-alone document containing “D-curve” examples
- See example on next slide



For inverter-based Energy Storage Resources, the reactive capability should be based on Inverter MVA Capability Curve.

Consistent with NERC Guideline on Reactive Capability for Inverter-based Energy Storage Resources

Example of an Inverter-based Energy Storage Resource

	MW	Minimum MVAR	Maximum MVAR	Comment
Point 1	-20	-22	22	Maximum Active Power CHARGING (Min MW)
Point 2	-14	-26	26	
Point 3	-7	-29	29	
Point 4	0	-30	30	Inverter MVA Capability Curve Rating
Point 5	6	-29	29	
Point 6	12	-27	27	
Point 7	18	-24	24	
Point 8	25	-17	17	Maximum Active Power DISCHARGING (Max MW)

Attachment E: PJM Generator, Energy Storage and Synchronous Condenser Reactive Capability Testing

- **Updated to include Energy Storage Resources**
 - Individual generating units and **inverter-based Energy Storage Resources** with a gross nameplate rating greater than 20 MVA and directly connected to the Bulk Electric System
 - Generating plants/facilities with a gross aggregate nameplate rating greater than 75 MVA including **inverter-based Energy Storage Resources**, and variable resources such as wind, solar, run of river hydro, etc.



M-14D – Changes Specific to ESR Participation Model

UNIT TYPE	MW OUTPUT	MVAR OUTPUT	TEST DURATION
FOSSIL, HYDROELECTRIC & BLACKSTART	MAX	MAX LAG	ONE HOUR
	MAX	MAX LEAD	WHEN LIMIT REACHED
	MIN	MAX LAG	WHEN LIMIT REACHED
	MIN	MAX LEAD	WHEN LIMIT REACHED
SYNCHRONOUS CONDENSER or GENERATOR THAT OPERATES IN THE SYNCHRONOUS CONDENSING MODE TO PROVIDE REACTIVE SUPPORT	-	MAX LAG	ONE HOUR
	-	MAX LEAD	WHEN LIMIT REACHED
NUCLEAR	MAX	MAX LAG	ONE HOUR
	MAX	MAX LEAD	WHEN LIMIT REACHED
VARIABLE (E.G. WIND AND SOLAR) (Testing done with at least 90% of turbines or inverters on line)	VARIABLE	MAX LAG	WHEN LIMIT REACHED
	VARIABLE	MAX LEAD	WHEN LIMIT REACHED
INVERTER-BASED ENERGY STORAGE RESOURCES Max MW Output = fully discharging Min MW Output = fully charging	MAX	MAX LAG	WHEN LIMIT REACHED
	MAX	MAX LEAD	WHEN LIMIT REACHED
	ZERO	MAX LAG	WHEN LIMIT REACHED
	ZERO	MAX LEAD	WHEN LIMIT REACHED
	MIN	MAX LAG	WHEN LIMIT REACHED
	MIN	MAX LEAD	WHEN LIMIT REACHED

TESTING REQUIREMENTS SUMMARY

Changes unrelated to Energy Storage Resource (ESR)

- Changes for consistency with M-13, Emergency Operations
- Cover to cover review
- Administrative changes
- Clarifying changes
- DRAFT changes related to Non-Retail BtMG covered in separate presentation

Section 7.3.5: Fuel and Emissions Reporting

- Replaced references to Supplementary Status Report (SSR) with references to Resource Limitations page in Markets Gateway
- Added guidance for Resource Limitations consistent with language added to M-13, Emergency Operations

M-14D – Administrative Changes Unrelated to ESR Participation Model

Performed periodic cover to cover review

Replaced references to Client Manager with Member Relations throughout

Corrected typos and capitalized terms where appropriate

- Generator Owner, generation resource owner, generation owner, generator's owner/operator replaced with Generation Owner for consistency

Section 1.2 - Generator Commercial Naming Convention

- Replaced Performance Compliance with Operations Analysis and Compliance

M-14D – Administrative Changes Unrelated to ESR Participation Model

Section 3.2.4 - Control Center Staffing Requirements

Remove reference
to Section 6 as it
relates to training
and certification
requirements

Section 10.2.3 – Implications for Terminating Black Start Units

Updated to cross-
reference correct
section – Section 9

Attachment N - Cold Weather Preparation Guideline and Checklist

Remove outdated
link to Polar Vortex
presentation

Manual 14-D, Rev 50 Review / Approval Timeline

